

Core Challenges for Spaceflight in the Twenty-first Century

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Rationales for Human Spaceflight

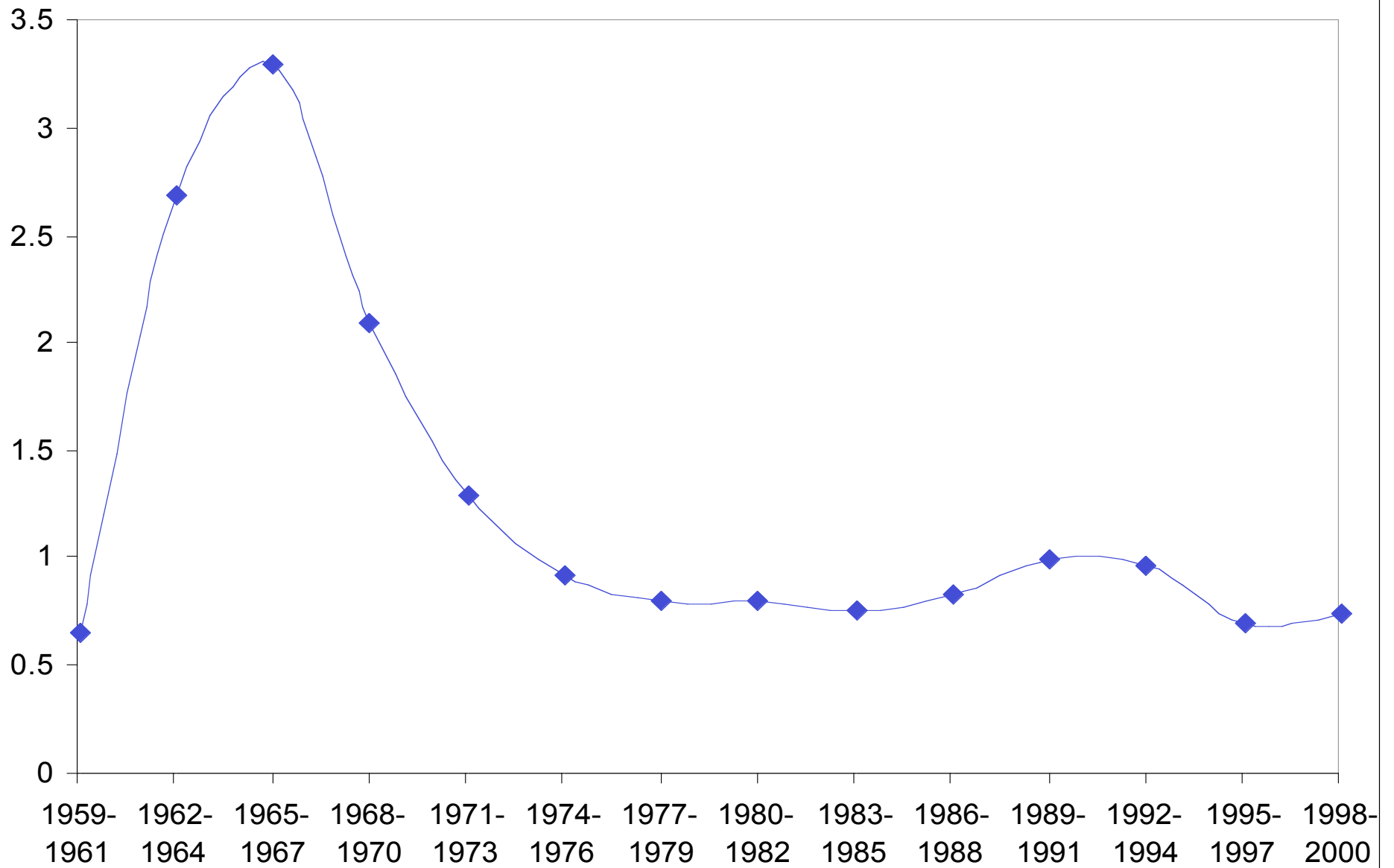
- Scientific Discovery and Understanding
- National Security
- Economic Competitiveness
- Human Destiny/Survival of the Species
- Prestige

Challenge One

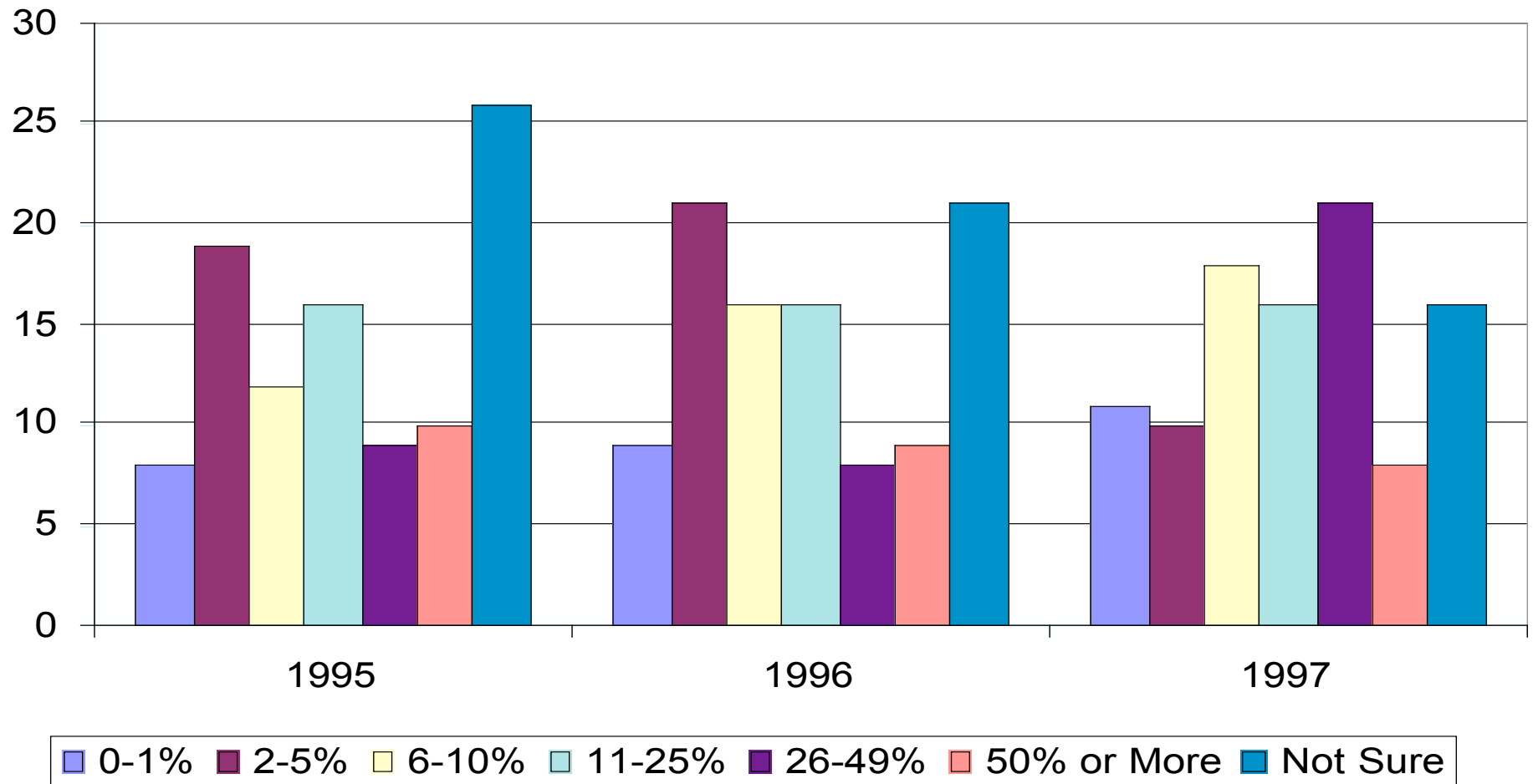


- **POLITICAL WILL**
- Confluence of public/political belief
- Demonstrate reason to expend national treasury on program by linkage to vital national objectives
- Explain “Why” rather than “How” or “What”

NASA BUDGET AS A PERCENTAGE OF THE FEDERAL BUDGET

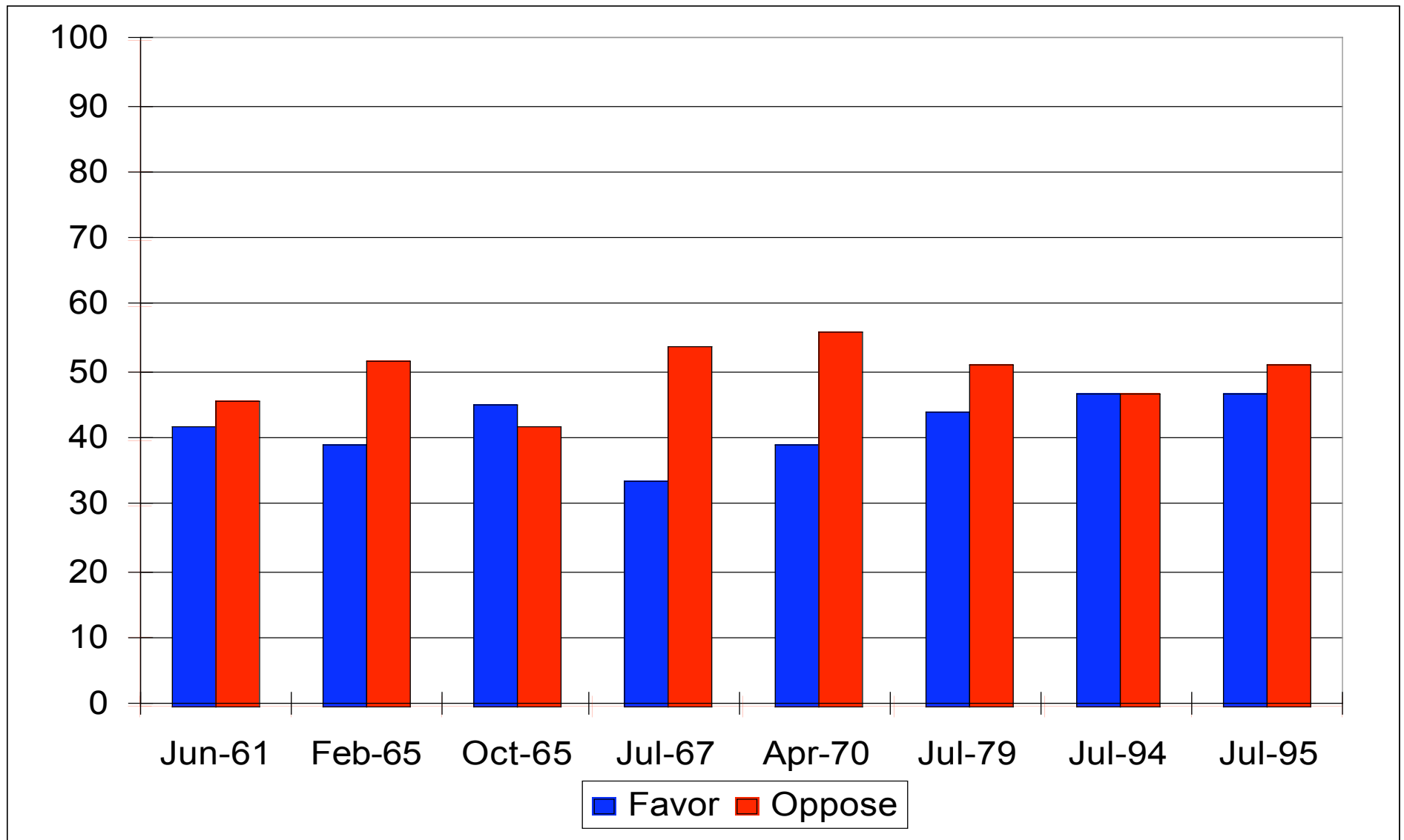


NASA'S ESTIMATED SHARE OF THE FEDERAL BUDGET



In 1997 the average estimate of NASA's share of the Federal budget by those polled was 20%. Had this been true, NASA's budget in 1997 would have been \$328b.

Public Support for Human Lunar Exploration



Challenge Two

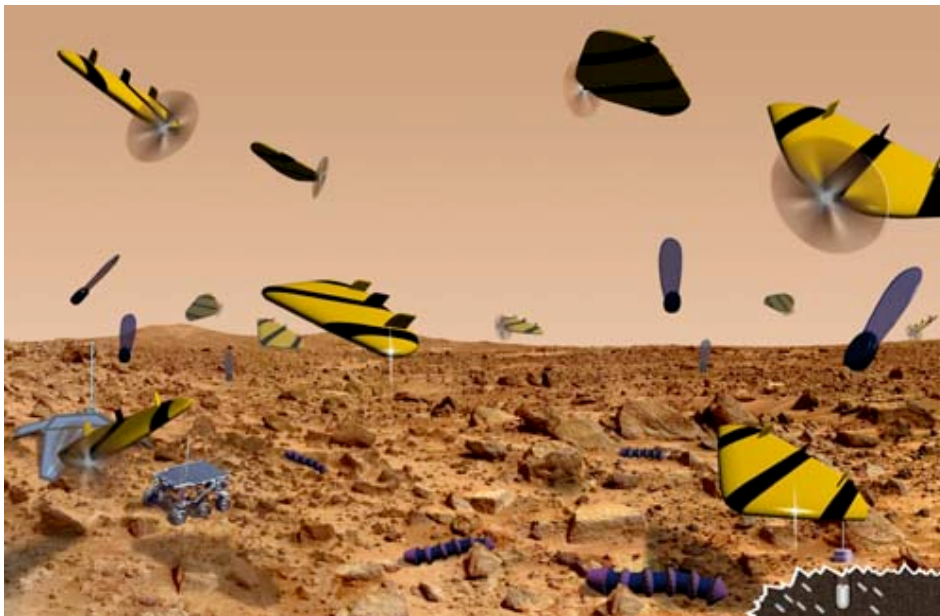


- **CHEAP, RELIABLE, MULTIFACETED, FLEXIBLE ACCESS TO SPACE**
- SSTO—Holy Grail of spaceflight
- Enormous technological and managerial obstacles
- Alternative propulsion technologies
- Lower life-cycle costs of systems

Major Policy Questions Arising from the *Columbia* Accident

1. Should there be a macro-level review of U.S. access to space coupled to decisions for the future?
2. Should there be a national-level review of NASA's long-term goals in human spaceflight? Who should undertake these reviews (commissions appointed by White House, Congress, NASA, other independent panels), and what parameters should exist concerning them?
3. What impact will the *Columbia* accident have upon commercial, military, scientific, international space (such as International Space Station) activities?
4. What is the future for humans in space?

Challenge Three



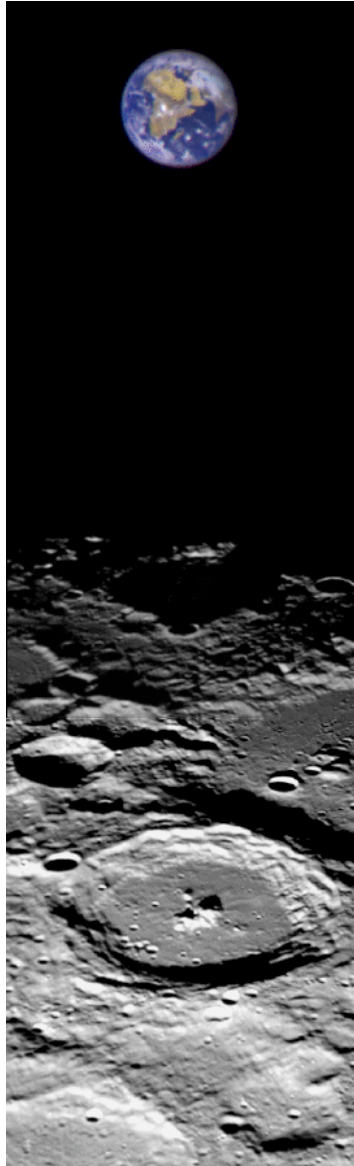
- **SMART ROBOTS**
- Geologists to the Moon and the planets, but they are robots
- Virtual exploration
- Offers remarkable possibilities but has genuine challenges
- Thus far, success rate for landing missions questionable

Challenge Four



- **PROTECTING THIS PLANET AND SPECIES**
- Monitoring the environment
- Military uses of space
- “Chicken Little was Right”—Asteroids, Comets, Meteors
- Extraterrestrial Life

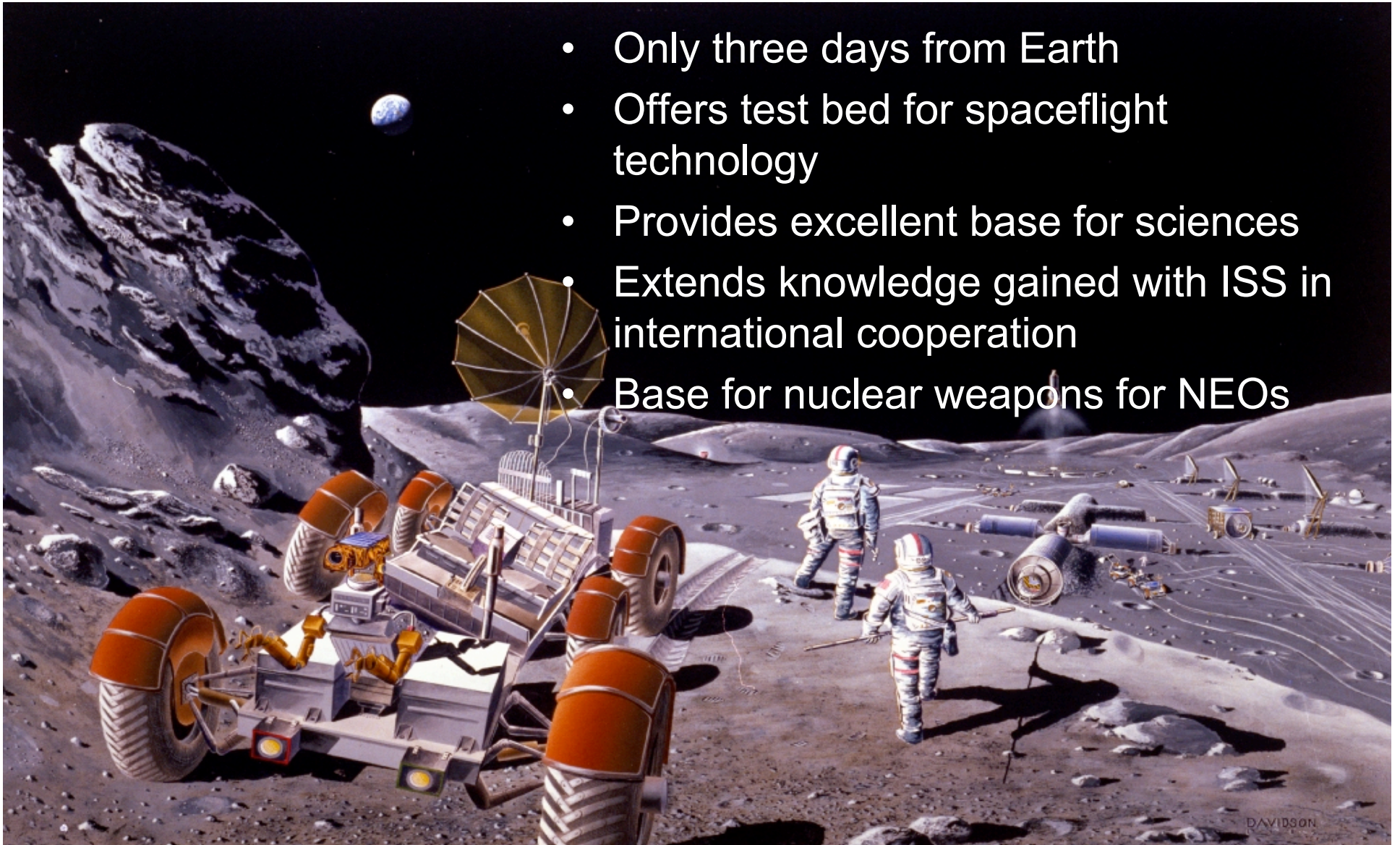
Challenge Five



- **BACK TO THE MOON
AND ON TO MARS**
- Strategies for continued human exploration of space
- Routine Earth orbital operations
- Human lunar exploration and settlement
- Can we get to Mars?

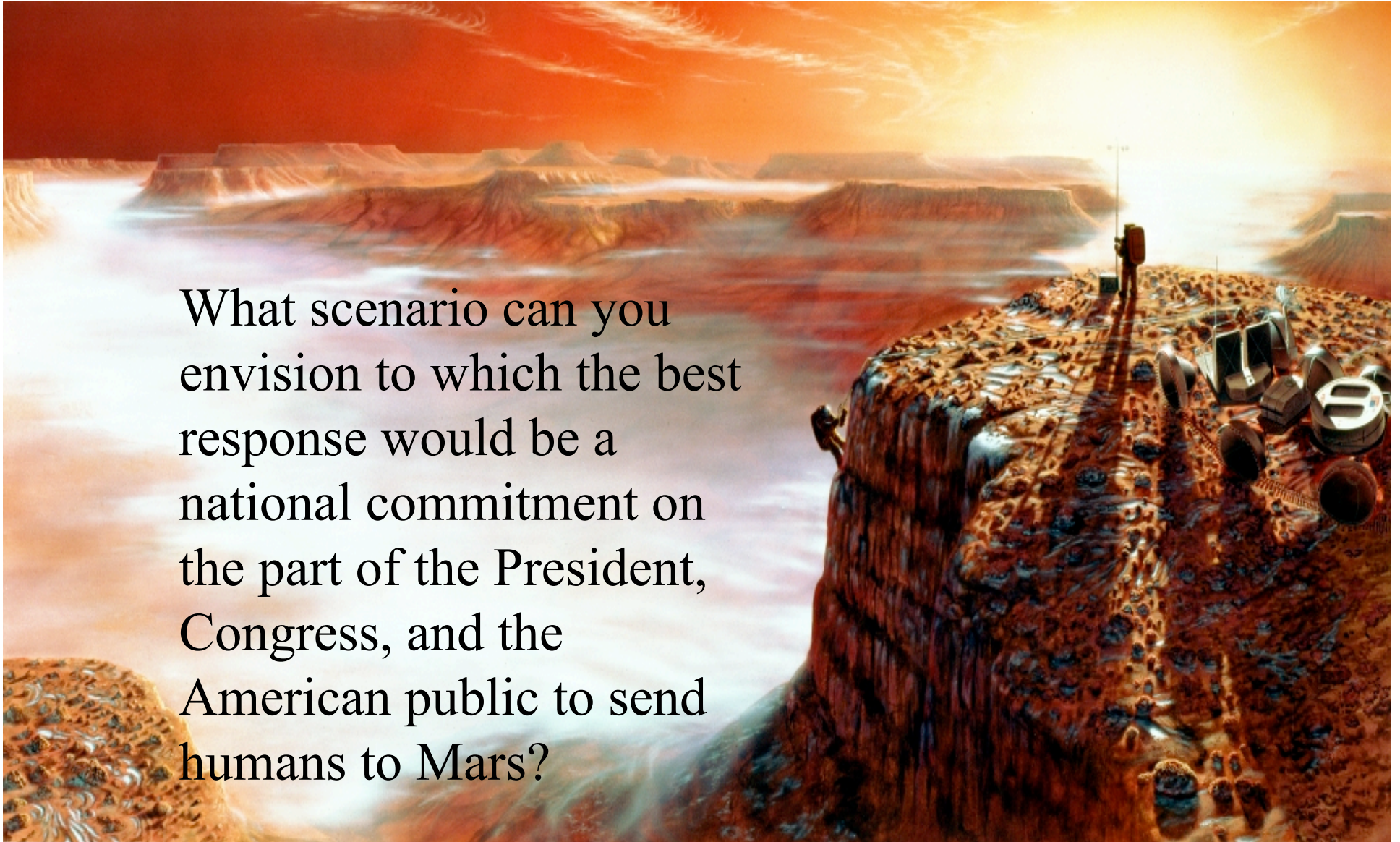
Expanded Human Lunar Exploration

- Only three days from Earth
- Offers test bed for spaceflight technology
- Provides excellent base for sciences
- Extends knowledge gained with ISS in international cooperation
- Base for nuclear weapons for NEOs

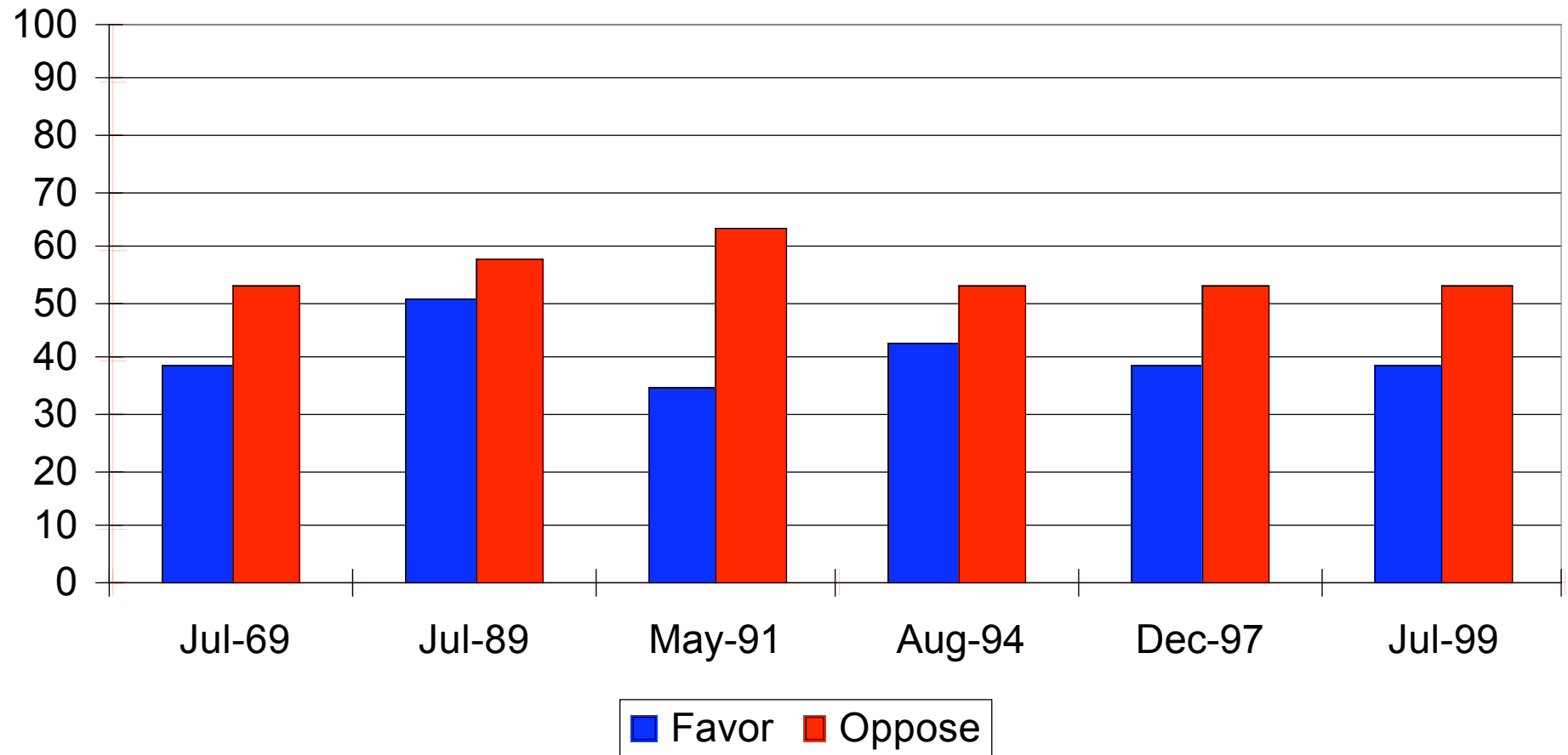


Human Expeditions to Mars

What scenario can you envision to which the best response would be a national commitment on the part of the President, Congress, and the American public to send humans to Mars?



SHOULD THE GOVERNMENT UNDERTAKE A HUMAN MISSION TO MARS?



Can We Ever Truly Become a Spacefaring Civilization?

Early Constitution Class Cruiser
USS Republic NCC-1371 Circa 2140 A.D.



Where there is no vision, people perish.

Proverbs 29:18